

Applic. No. : 09/816,923

Remarks:

Reconsideration of the application is requested.

Claims 1-11 remain in the application.

In the second paragraph on page 2 of the above-identified Office action, the disclosure has been objected to. The Examiner stated that "[t]he related application information should be updated." The related application information of the instant application has already been updated in the last response. If the Examiner maintains the objection, the Examiner is respectfully requested to explain the reasons in greater detail and clarity so that Counsel can formulate a meaningful response.

In the third paragraph on page 2 of the above-identified Office action, claims 1-11 have been rejected as being based on a disclosure which is not enabling under 35 U.S.C. § 112, first paragraph.

The Examiner stated that: "The barrier layer is critical or essential to the practice of the invention, but not included in the claim(s) is not enabled by the disclosure."

More specifically, the Examiner stated that:

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In the specification, several elements are described by the following: For example, on page 11, line 22, "an insulating diffusion barrier layer 2"; on page 12, line 6, the insulating barrier layer 2; page 12, line 16, "a first diffusion barrier structure 5"; page 13, line 1, "a first diffusion barrier layer 7"; on page 13, line 22, "a conformal diffusion barrier layer 11"; on page 15, line 6, "a second conductive diffusion barrier layer 12" are described. In the claims, several elements are described by the following: a diffusion barrier layer; an electrically conductive first diffusion barrier structure; and an electrically conductive second diffusion barrier structure. It is unclear and confusing to which element is describing which between the elements in the specification and the claims.

The specification and the claims have been carefully reviewed by Applicant and on page 15, line 6, of the instant application the word "layer" has been replaced with the word "barrier".

Claim 1 calls for, inter alia:

an insulating layer;

a first conductive structure embedded in said insulating layer;

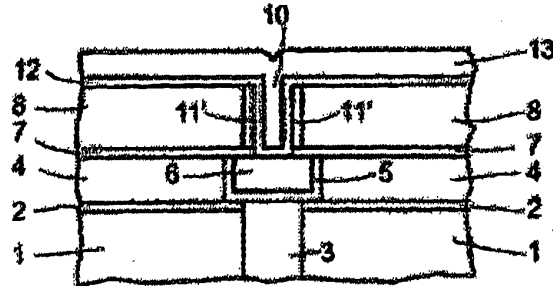
**a diffusion barrier layer** and a second insulating layer **disposed above said first conductive structure and being formed with a contact hole** reaching as far as said first conductive structure and having side walls;

a second conductive structure disposed in said contact hole and conductively connected to said first conductive structure; and

**spacers** formed on said side walls of said contact hole **above said diffusion barrier layer**, said spacers acting as a barrier to diffusion of a material from said first conductive structure into said second insulating layer

and reaching as far as a surface of said diffusion barrier layer.

Fig. 5 of the instant application is re-produced below:



Just by reading the emphasized claim language of claim 1, it is clear that the "diffusion barrier layer" is the "first diffusion barrier layer 7" discussed in the specification. This is further clearly stated in the first paragraph on page 13 of the instant application.

Claim 3 (similarly claim 6) recites "an electrically conductive *first diffusion barrier structure* adjoining said first conductive structure at least beneath and to a side thereof and acting as a barrier to diffusion of material from said first conductive structure." (emphasis added). The preferred embodiment described in the specification discloses a "first diffusion barrier structure 5" which corresponds to the recited "electrically conductive first diffusion barrier structure" in claims 3 and 6.

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Claim 4 recites "an electrically conductive **second diffusion barrier structure** adjoining said second conductive structure at least beneath said second conductive structure and acting as a barrier to diffusion of material from said second conductive structure." (emphasis added). The preferred embodiment described in the amended specification discloses a "second diffusion barrier structure 12" which corresponds to the recited "electrically conductive second diffusion barrier structure" in claim 4.

It is accordingly believed that the specification is enabling and that the claims recite all essential elements and essential structural cooperative relationships of elements as required by MPEP § 706.03(d) (8th edition, 1st revision).

It is accordingly believed that the specification and the claims meet the requirements of 35 U.S.C. § 112. Should the Examiner find any further objectionable items, Counsel would appreciate a telephone call during which the matter may be resolved.

In the preultimate paragraph on page 3 of the Office action, claims 1-11 have been rejected as being anticipated by Greco et al. (US 6,221,780) under 35 U.S.C. § 102.

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In the second paragraph on page 4 of the Office action, claims 1-11 have been rejected as being anticipated by Yeh et al. (US 2002/0098673A1) under 35 U.S.C. § 102.

The instant application is a **continuation** of copending International Application No. PCT/DE99/02927, filed September 14, 1999, which designated the United States. Consequently, the instant application has an effective US filing date of September 14, 1999. Since the effective US filing date of the instant application predates the U.S. application filing date of Greco et al. (September 29, 1999) and Yeh et al. (January 19, 2001), Greco et al. and Yeh et al. are not available as prior art against the instant application.

To corroborate the copendency of the instant application and the designation of the United States in the International Application, a copy of the first page of the International Application and the International Preliminary Examination Report (PCT/IPEA/409) are enclosed.

It is noted that Applicant request and received a new "Corrected Filing Receipt" dated August 17, 2001, claiming a foreign priority date of September 23, 1998.

In view of the foregoing, reconsideration and allowance of claims 1-11 are solicited.

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In the event the Examiner should still find any of the claims to be unpatentable, the Examiner is respectfully requested to telephone Counsel so that, if possible, patentable language can be worked out. In the alternative, the entry of the amendment is requested as it is believed to place the application in better condition for appeal, without requiring extension of the field of search.

If an extension of time is required, petition for extension is herewith made.

Please charge any fees which might be due with respect to Sections 1.16 and 1.17 to the Deposit Account of Lerner and Greenberg, P.A., No. 12-1099.

Respectfully submitted,

  
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Version with markings to show changes made:

Page 14, line 23, through page 15, line 10, --

Then, a second conductive diffusion barrier layer is deposited, which covers the surface of the second insulating layer 8, the spacers 11' and the exposed surface of the first conductive structure 6. The second conductive diffusion barrier layer is formed of TaN, in a layer thickness of 10 nm to 50 nm, by means of PVD or CVD deposition. By depositing a further copper layer, which fills up the remaining clearance in the contact hole 10, and structuring the copper layer and the second conductive diffusion barrier layer arranged underneath it, a second diffusion barrier [layer] structure 12 and a second conductive structure 13 are formed, the latter being conductively connected to the first conductive structure 6 (see Fig. 5). The second conductive structure 13 is configured as a conductor track belonging to a metalization plane. --

# VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS

## PCT

### INTERNATIONALER VORLÄUFIGER PRÜFUNGSBERICHT



(Artikel 36 und Regel 70 PCT)

Aktenzeichen des Anmelders oder Anwalts <b>In1026WO /GR98P2661P</b>	<b>WEITERES VORGEHEN</b> siehe Mitteilung über die Übersendung des internationalen vorläufigen Prüfungsberichts (Formblatt PCT/IPEA/418)	
Internationales Aktenzeichen <b>PCT/DE99/02927</b>	Internationales Anmeldedatum (Tag/Monat/Jahr) <b>14/09/1999</b>	Prioritätsdatum (Tag/Monat/Tag) <b>23/09/1998</b>
Internationale Patentklassifikation (IPK) oder nationale Klassifikation und IPK <b>H01L23/522</b>		
Anmelder <b>INFINEON TECHNOLOGIES AG et al.</b>		

- Dieser internationale vorläufige Prüfungsbericht wurde von der mit der internationalen vorläufigen Prüfung beauftragten Behörde erstellt und wird dem Anmelder gemäß Artikel 36 übermittelt.
- Dieser **BERICHT** umfaßt insgesamt 5 Blätter einschließlich dieses Deckblatts.  
☒ Außerdem liegen dem Bericht **ANLAGEN** bei; dabei handelt es sich um Blätter mit Beschreibungen, Ansprüchen und/oder Zeichnungen, die geändert wurden und diesem Bericht zugrunde liegen, und/oder Blätter mit vor dieser Behörde vorgenommenen Berichtigungen (siehe Regel 70.16 und Abschnitt 607 der Verwaltungsrichtlinien zum PCT).  
Diese Anlagen umfassen insgesamt 1 Blätter.

3. Dieser Bericht enthält Angaben zu folgenden Punkten:

- I ☒ Grundlage des Berichts
- II ☐ Priorität
- III ☐ Keine Erstellung eines Gutachtens über Neuheit, erfinderische Tätigkeit und gewerbliche Anwendbarkeit
- IV ☐ Mangelnde Einheitlichkeit der Erfindung
- V ☒ Begründete Feststellung nach Artikel 35(2) hinsichtlich der Neuheit, der erfinderischen Tätigkeit und der gewerblichen Anwendbarkeit; Unterlagen und Erklärungen zur Stützung dieser Feststellung
- VI ☐ Bestimmte angeführte Unterlagen
- VII ☐ Bestimmte Mängel der internationalen Anmeldung
- VIII ☐ Bestimmte Bemerkungen zur internationalen Anmeldung

Datum der Einreichung des Antrags  <b>14/03/2000</b>	Datum der Fertigstellung dieses Berichts  <b>21.12.2000</b>
Name und Postanschrift der mit der internationalen vorläufigen Prüfung beauftragten Behörde:   <b>Europäisches Patentamt</b> <b>D-80298 München</b> <b>Tel. +49 89 2399 - 0 Tx: 523656 epmu d</b> <b>Fax: +49 89 2399 - 4465</b>	Bevollmächtigter Bediensteter  <b>Cortes Rosa, Joao</b>  <b>Tel. Nr. +49 89 2399 2264</b> 

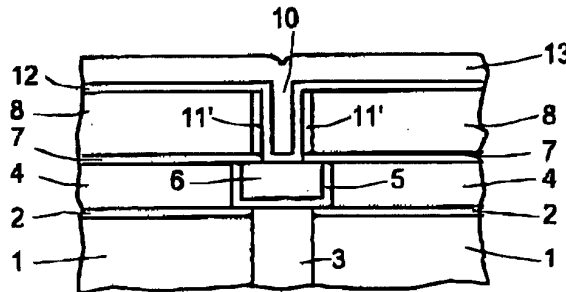


**PCT**WELTORGANISATION FÜR GEISTIGES EIGENTUM  
Internationales BüroINTERNATIONALE ANMELDUNG VERÖFFENTLICHT NACH DEM VERTRAG ÜBER DIE  
INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT)

(51) Internationale Patentklassifikation 7 : <b>H01L 23/522</b>	<b>A1</b>	(11) Internationale Veröffentlichungsnummer: <b>WO 00/17928</b> (43) Internationales Veröffentlichungsdatum: 30. März 2000 (30.03.00)
(21) Internationales Aktenzeichen: PCT/DE99/02927 (22) Internationales Anmeldedatum: 14. September 1999 (14.09.99) (30) Prioritätsdaten: 198 43 624.6 23. September 1998 (23.09.98) DE (71) Anmelder (für alle Bestimmungsstaaten ausser US): SIEMENS AKTIENGESELLSCHAFT [DE/DE]; Wittelsbacherplatz 2, D-80333 München (DE). (72) Erfinder; und (75) Erfinder/Anmelder (nur für US): ENGELHARDT, Manfred [DE/DE]; Edelweissstrasse 1A, D-83620 Feldkirchen-Westerham (DE). (74) Gemeinsamer Vertreter: SIEMENS AKTIENGESELLSCHAFT; Postfach 22 16 34, D-80506 München (DE).	(81) Bestimmungsstaaten: JP, KR, US, europäisches Patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Veröffentlicht Mit internationalem Recherchenbericht. Vor Ablauf der für Änderungen der Ansprüche zugelassenen Frist: Veröffentlichung wird wiederholt falls Änderungen eintreffen.	

(54) Title: INTEGRATED CIRCUIT AND METHOD FOR PRODUCING THE SAME

(54) Bezeichnung: INTEGRIERTE SCHALTUNGSANORDNUNG UND VERFAHREN ZU DEREN HERSTELLUNG



## (57) Abstract

The invention relates to an integrated circuit wherein a first barrier layer (7) and a second insulating layer (8) are located above a first conductive structure (6), which is embedded in a first insulating layer (4). A contact hole (10) is provided in said first barrier layer and second insulating layer, said contact hole extending as far as the first conductive structure (6). The side walls of the contact hole (10) are provided with spacers above the first barrier layer (7). These spacers act as diffusion barriers and extend as far as the surface of the first barrier layer (7). A second conductive structure (13) is located in the contact hole (10) and is conductively connected to the first conductive structure (6). The spacers prevent material from the first conductive structure (6) from being deposited on the surface of the second insulating layer (8) while the contact hole is being made.